

Status of *Penitella gabbii* (Tryon, 1863) in the Eastern and Western Pacific, and Description of the Previously Misidentified Eastern Pacific Species (Bivalvia: Pholadidae)

by

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Abstract. The pholadid bivalve *Penitella gabbii* (Tryon, 1863), originally cited as coming from the "Coast of Japan?" but believed by Tryon to be a California species, has been treated erroneously by all subsequent workers as an eastern Pacific species. The species is actually from the western Pacific and occurs at least from northeastern to southwestern Japan. "*Penitella gabbii* (i)" of authors, not Tryon, 1863, from the Pacific coast of North America, is without an available name and is described herein as *P. richardsoni* sp. nov.

INTRODUCTION

Despite several existing monographs on the family Pholadidae (Mollusca: Bivalvia) of the eastern Pacific region (TURNER, 1954, 1955; KNUDSEN, 1961; KENNEDY, 1974), a number of nomenclatural problems in the family remain unresolved (KENNEDY, 1985), particularly among species of *Penitella* Valenciennes, 1846, from the North Pacific region. This paper discusses the status of *Penitella gabbii* (Tryon, 1863) in the eastern and western Pacific, and describes as new the previously misidentified eastern Pacific species.

Penitella gabbii was described as *Zirphaea gabbii* Tryon, 1863, and considered by its author to be a Californian species. For nearly 70 years, however, the name was applied to the common eastern Pacific *Zirfaea* by most workers. LOWE (1931:52) recognized that Tryon's species belonged in *Penitella*, but erroneously placed it in synonymy with *P. penita* "var." *concamerata* (Deshayes, 1839), itself a junior synonym of *P. penita* (Conrad, 1837). Although *Zirfaea pilsbryi* Lowe, 1931, was proposed for the eastern Pacific *Zirfaea*, the combination "*Zirfaea gabbii* (i)" continues to creep into the literature.

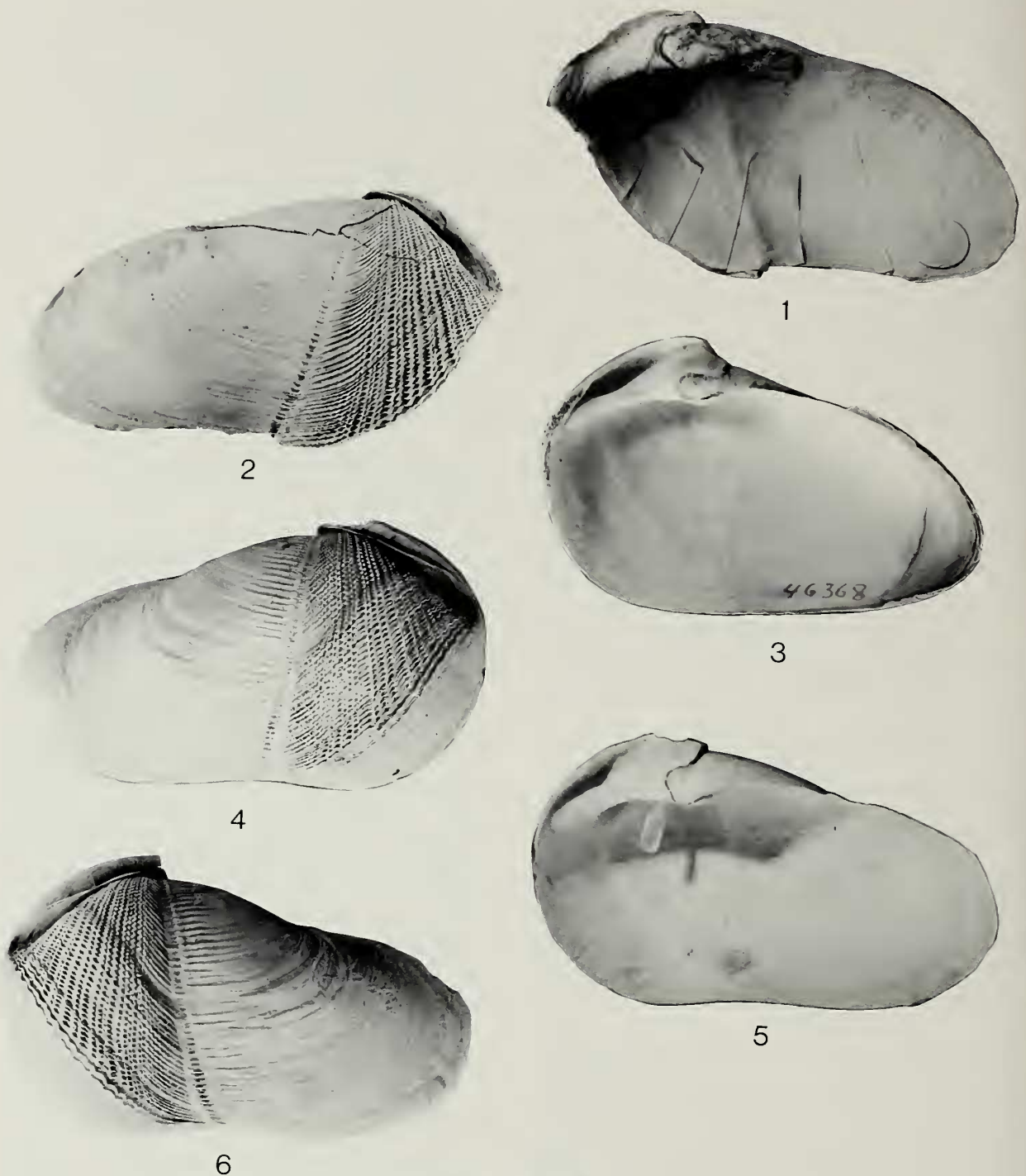
TURNER (1955) interpreted TRYON's (1863) species to be the *Penitella* that is best known from museum specimens from Monterey Bay, California, a site subsequently designated by her as the "type locality" (TURNER, 1955:87).

This interpretation of *P. gabbii* was followed in citing fossil records for the species (KENNEDY, 1974:45-47). Recent examination of the holotype of *Zirphaea gabbii* (= *Penitella gabbii*), and of new and previously unstudied specimens of Japanese pholadids in USA and Japanese collections, suggests that this interpretation was incorrect (KENNEDY, 1985:13).

The description of *Zirphaea gabbii* was based on "a single valve, somewhat mutilated" from the "Coast of Japan?" (TRYON, 1863:44). However, the situation was better explained by GABB (1869:52-53), thusly:

This shell was described by Mr. Tryon from a single dead valve, sent to him by me from San Francisco. I obtained it from a miscellaneous collection of shells from Japan, and have no reason to doubt but that the specimen came from Japan with the collection. Mr. Tryon has long held the belief that it was mixed with the others by accident, and that it was a California specimen. However that may be, I cannot tell; and we have, at present, no means of settling the question. The species is found in California in both a recent and fossil state, large valves [= *Zirfaea pilsbryi*] being quite common in the Post-Pliocene [= Pleistocene] of San Pedro; nevertheless I do not consider this any proof that it may not, likewise, be found living in Japan.

Despite these early comments about a possible Japanese origin for the type specimen, no subsequent worker has compared it with other Japanese specimens. Examination



Explanation of Figures 1 to 6

Figures 1-6. *Penitella gabbii* (Tryon, 1863). Figures 1, 2: ANSP 51085, holotype of *Zirphaea gabbii*, from "Coast of Japan?"; length, 56 mm. Specimen is adult shell with most of callum broken away. Figure 3: CAS 028806 (ex SU 46368), from Onahama Bay, Fukushima Pref., Japan; length, 49 mm. Figures 4-6: USNM 563670, from Yotsukura coast, Fukushima Pref., Japan; length, 60 mm.

of the holotype, ANSP 51085 (see Figures 1, 2), reveals that it is identical with other large specimens of *Penitella* from Japan (Figures 3–6), and distinct from eastern Pacific specimens (Figures 7, 10–15) previously assigned to that species. Because there is no available name for the eastern Pacific species, it is described as new below. Descriptive terminology follows that of KENNEDY (1974:11–13, fig. 2).

The following institutional abbreviations are used: AMNH, American Museum of Natural History, New York; ANSP, Academy of Natural Sciences, Philadelphia; CAS, California Academy of Sciences, San Francisco; LACM and LACMIP, Natural History Museum of Los Angeles County, Los Angeles (LACMIP, Invertebrate Paleontology; LACM, Invertebrate Zoology (Malacology)); MCZ, Museum of Comparative Zoology, Cambridge; NMC, National Museum of Natural Sciences, Ottawa; NSMT, National Science Museum, Tokyo; SBMNH, Santa Barbara Museum of Natural History, Santa Barbara; SDSNH, San Diego Museum of Natural History, San Diego; SU, Stanford University, Stanford (collections at CAS); UCLA, University of California, Los Angeles (collections at LACM and LACMIP); UCMP, University of California Museum of Paleontology, Berkeley; UMUT, University Museum, University of Tokyo, Tokyo; and USNM, U.S. National Museum of Natural History, Washington.

SYSTEMATICS

Family PHOLADIDAE Lamarck, 1809

Subfamily MARTESIINAE Grant & Gale, 1931

Genus *Penitella* Valenciennes, 1846

Type species: *Penitella conradi* Valenciennes, 1846, by subsequent designation (GRANT & GALE, 1931:433).

Western Pacific

Penitella gabbii (Tryon, 1863)

(Figures 1–6)

Zirphaea Gabbii TRYON, 1863:144, pl. 1, fig. 1.

Z.[zirphaea] Gabbii: GABB, 1869:52, 88, in part; not pl. 15, fig. 10; (*Penitella gabbii* [holotype], in part *Zirfaea pilsbryi* [fossils], and *Chaceia ovoidea* [figured specimen]).

Penitella gabbii: TURNER, 1955:87, in part, pl. 53, fig. 2 [holotype]; not p. 85, pls. 52, 53 (fig. 1), 54; (*Penitella gabbii* [references to and figure of holotype], in part *P. richardsoni* [most records], and *P. turnerae*).

not *Penitella gabbii*: TURNER, 1962:306 (= *Penitella turnerae*); ADEGOKE, 1967:16 (= *Penitella richardsoni* [modern records], and *Zirfaea pilsbryi* [fossil records]).

not *Zirfaea gabbii* (Tryon) *femii* ADEGOKE, 1967:17 (*nomen nudum*, manuscript name); ADEGOKE, 1969:154, "fig. 6A"; pl. 9, figs. 2, 8, 11–12; pl. 10, figs. 3, 5–6, 13. [Both = *Zirfaea pilsbryi*.]

not *Penitella gabbii*: KENNEDY, 1974:45, figs. 36–40; HADERLIE & ABBOTT, 1980:392, fig. 15.77; pl. 127, fig. 15.77. [Both = *Penitella richardsoni*.]

Diagnosis: Moderately large species of *Penitella*, adult length to 7.2 cm, but more frequently 5–6 cm in length. Callum complete, barely protrudes beyond beaks. Umbonal reflection flared, free anteriorly, lightly appressed over umbones. Periostracal attachment scars present within siphonal opening. Siphonoplax lacking.

Penitella kamakurensis (Yokoyama, 1922) and *P. chishimana* (Habe, 1955) are very similar to *P. gabbii*, if not synonymous; *P. kamakurensis* of authors, not YOKOYAMA (1922), differs in its smaller size, partial (incomplete) callum, reduced anterodorsal margin (which is not concave as in *P. gabbii*), appressed umbonal reflection, more lobate dorsal extension of callum, and leafy periostracal fringe on posterior margin.

Description: Adult shell oval in outline, moderately light in structure, reaching 7.2 cm in length (LACM 129158), but more often 5–6 cm long. Immature specimens beaked, widely gaping anteriorly; pedal gape closed by complete callum in adult; rounded and closed posteriorly. Anterior slope sculptured by close-set, upturned undulating concentric ridges, and radial "ribs" formed by aligned undulations of the ridges. Umbonal-ventral sulcus prominent, with ladderlike or steplike appearance due to inter-ridge depressions between upturned concentric ridges where they cross sulcus. Undulations reduced and finer near sulcus, where ridges bend in sweeping curve as they approach and cross sulcus. Disc and posterior slope sculptured by concentric growth lines and low rounded ridges that are extensions of those on the anterior slope.

Umbones prominent, located near anterior third of shell. Anterodorsal margin distinctly concave between umbones and beaks. Umbonal reflection relatively narrow, flaring, free anteriorly with gap between it and anterior slope, loosely appressed over umbones. Dorsal extension of callum narrow, not lobate.

Mesoplax unknown.

Umbonal-ventral ridge distinct, often with beaded appearance due to internal expression of intersection of sulcus and concentric ridges. Muscle scars visible, generally smooth. Ventral muscle scar long, narrow, overlaps umbonal-ventral ridge. Posterior muscle scar elongate-oval in outline. Pallial sinus broad, extends to or just beyond umbonal-ventral ridge. Apophyses flattened, with gentle curvature, not bladellike, rotated 40–50° from long axis of shell, protruding at angle distinctly anterior to that of umbonal-ventral ridge.

Periostracum usually worn off disc region, dark brown on posterior slope; posterior margin without leafy periostracal fringe. Siphonoplax lacking. Periostracal attachment scars present inside siphonal opening. Anatomy unknown.

Holotype: Of *Zirphaea gabbii* Tryon, ANSP 51085. Dimensions: length, 56 mm; height, ca. 30 mm.

Type locality: "Coast of Japan?" (TRYON, 1863:144; see also comments of GABB (1869:53) quoted in the Introduction). Subsequent restriction of the "type locality" to Mon-

terey Bay, California by TURNER (1955:87) is invalid because it was based on specimens of *Penitella richardsoni* sp. nov. rather than of *P. gabbii*.

Distribution: Based on a limited number of species lots in North American institutions, *Penitella gabbii* ranges on the Pacific coast of Japan at least from northeastern Honshu to southwestern Kyushu; its actual distribution is certainly more extensive.

HONSHU: Miyagi Prefecture: Hanabuchi, Hichigahama-machi (38°18'N) (LACM 129158). Fukushima Prefecture: Matsukawa-ura (37°39'N) (LACM 140430); Yotsukura coast (USNM 563670); Onahama-ura (36°57'N) (CAS 028806 [*ex* SU 46368]). **KYUSHU:** Nagasaki Prefecture: Nagasaki (32°45'±10'N) (USNM 249277).

Remarks: The Recent and fossil species of *Penitella* in the northwestern Pacific region, Japan and far eastern USSR, are in taxonomic disarray and in need of revision. *Penitella gabbii*, however, has priority over all existing nominal taxa. *Penitella kamakurensis* (Yokoyama, 1922) and *P. chishimana* (Habe, 1955) are very similar to *P. gabbii*, if not synonymous with it; both taxa are poorly understood. *Penitella chishimana* was based on two specimens from the northern Kurile Islands, an unfigured right valve (holotype) 51.7 mm in length, and a smaller paired specimen (paratype) 29.9 mm in length, of which the exterior of the right valve and the interior aspect of the mesoplax were figured (HABE, 1955:23–24, pl. 7, figs. 8, 9; TAKI & HABE, 1955:12, pl. 2, figs. 9, 10). The line drawing of the paratype shows a heavy(?), somewhat irregularly shapen valve that may have been affected by boring into an indurated substrate, conditions that would also have affected the aspect of the umbonal reflection. The mesoplax is broadly angulate posteriorly.

The lectotype of *Jouannetia kamakurensis* (= *Penitella kamakurensis*), designated by OYAMA (1973:caption for pl. 56, fig. 6a–c; see also KENNEDY, 1974:48), is a Recent juvenile shell only 7.6 mm in length (YOKOYAMA, 1922:120, pl. 6, fig. 10; K. Chinzei, *in litt.*, 26 October 1972). The anterior dorsal margin of the lectotype (UMUT CM21154; see ICHIKAWA, 1983) is similar in aspect to that of *P. gabbii*, but is proportionately longer and decidedly more concave than in similar-sized specimens (*e.g.*, NSMT Mo64597) of the undescribed species that is most commonly illustrated as *P. kamakurensis* (*e.g.*, HABE, 1955:pl. 7, figs. 5, 6; TAKI & HABE, 1955:pl. 2, figs. 14, 15; HABE & KOSUGE, 1967:pl. 63, fig. 15; KURODA *et al.*, 1971:pl. 102, fig. 8; HABE & OKUTANI, 1975:144 [4 figs.]). The paralectotype of *P. kamakurensis* (CM21155) has not been figured. Alaskan specimens previously cited as *P. kamakurensis* by KENNEDY (1974:48, fig. 60) are *Penitella hopkinsi* Kennedy & Armentrout, 1989. The Chinese taxa, *Pholadidea (Monoplax) dolichothyra* Thang, Tsi & Li, 1960, and *P. (M.) acutithyra* Thang, Tsi & Li, 1960, are not synonyms of *Penitella kamakurensis* as has been suggested by BERNARD (1983:61).

Eastern Pacific

Penitella richardsoni Kennedy, sp. nov.

(Figures 7–15)

not *Z. [irphaea] Gabbii*: GABB, 1869:52, 88, pl. 15, fig. 10; (*Penitella gabbii* [type], *Zirfaea pilsbryi* [fossils], and *Chaceia ovoidea* [pl. 15, fig. 10]).

not *Zirfaea gabbii* (*i*): *auctt.*; (most = *Zirfaea pilsbryi*).

Penitella gabbii (*i*): *auctt.*, in part; not *Zirphaea gabbii* Tryon, 1863.

Penitella gabbii: TURNER, 1955:85, in part, pls. 52, 53 (fig. 1), 54; not pl. 53, fig. 2; (*Penitella richardsoni* [most eastern Pacific records], *P. turnerae*, and *P. gabbii* [figured type]); ADEGOKE, 1967:16, in part (*Penitella richardsoni* [modern], and *Zirfaea pilsbryi* [all fossil records]).

not *Penitella gabbii*: TURNER, 1962:306 (= *Penitella turnerae*). not *Zirfaea gabbii* (Tryon) *femii* ADEGOKE, 1967:17 (*nomen nudum*, manuscript name); ADEGOKE, 1969:154, “fig.” 6A; pl. 9, figs. 2, 8, 11, 12; pl. 10, figs. 3, 5, 6, 13. [Both = *Zirfaea pilsbryi*.]

Penitella gabbii: KENNEDY, 1974:45, figs. 36–40 (contains synonymy for fossil records); HADERLIE & ABBOTT, 1980:392, fig. 15.77; pl. 127, fig. 15.77.

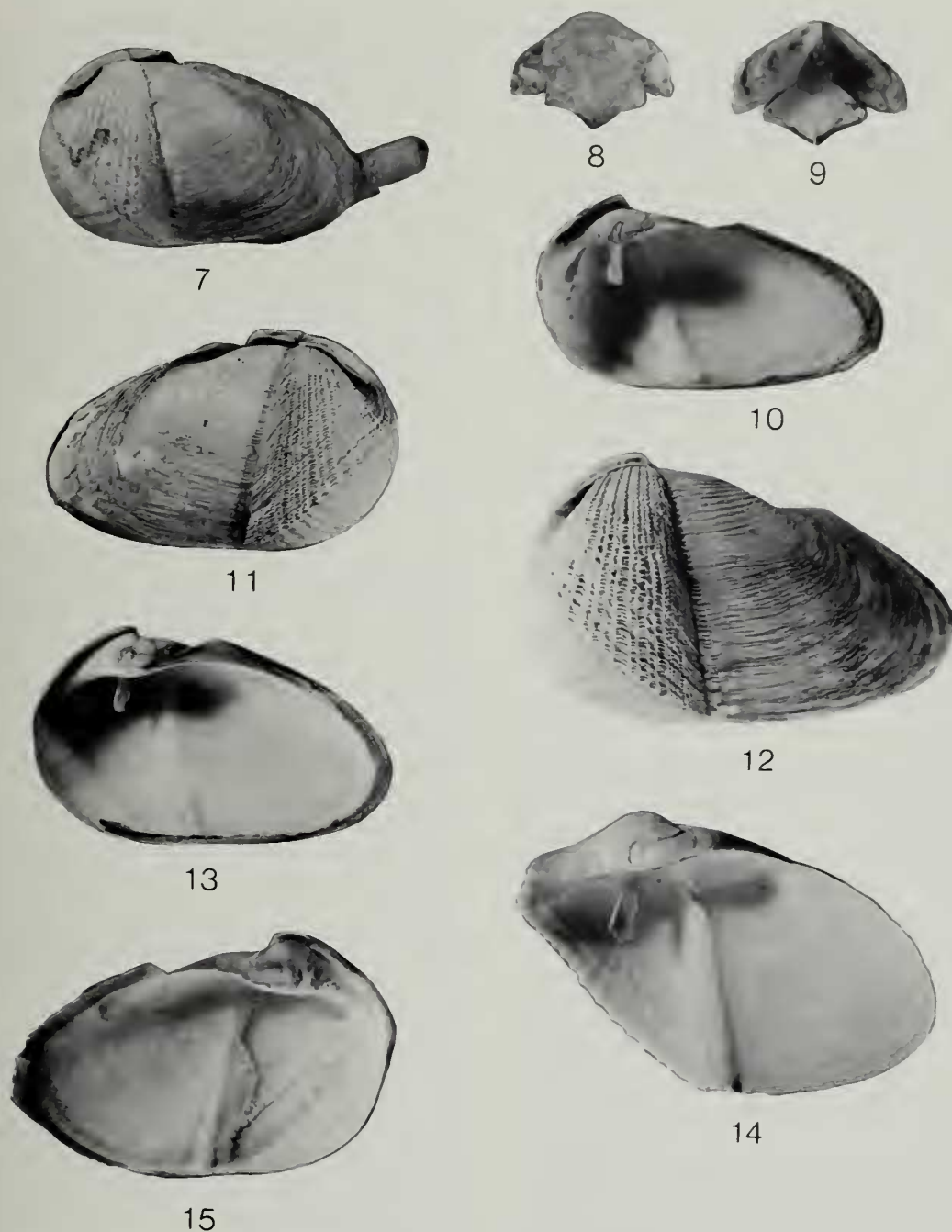
Diagnosis: Medium-sized species of *Penitella*, adult length to about 4.5 cm. Callum complete, does not protrude beyond beaks. Umbonal reflections narrow, lightly appressed over umbones, free anteriorly. Mesoplax with blunt, ventrally directed point and broad lateral wings posteriorly. Periostracum not present inside siphonal opening except as narrow marginal band. Siphonoplax lacking. Siphons creamy white, with “warty” protuberances.

Description: Adult shell oval in outline, moderately solid in structure, reaching 6 cm in length (LACM 86-239.1), but rarely exceeding 4.5 cm. Immature specimens beaked, widely gaping anteriorly, closed by complete callum in adult; rounded and closed posteriorly. Anterior slope sculptured by close-set, upturned, undulating, concentric ridges, and radial “ribs” formed by aligned undulations of the ridges. Umbonal-ventral sulcus prominent, marked by angular junction of concentric ridges of anterior slope and growth lines on disc. Disc and posterior slope sculptured with concentric growth lines and obscure, low, rounded ridges. Umbones prominent, located near anterior third of shell.

Umbonal reflection narrow, lightly appressed over umbo, free centrally and anteriorly. Callum complete, usually perfectly ovoid in shape, smooth or sculptured by weak radial extensions of sculpture of anterior slope, not protruding anterior to beaks. Dorsal extension of callum narrow, not lobate.

Mesoplax transverse, situated posterior to umbones, main body about as wide as long, truncate or pointed anteriorly, rounded posteriorly with a blunt, ventrally directed point, and with wide lateral wings posteriorly.

Umbonal-ventral ridge low, prominent in actively boring specimens, but inconspicuous in adults. Muscle scars visible, not roughened. Ventral muscle scar long, narrow,



Explanation of Figures 7 to 15

Figures 7-15. *Penitella richardsoni* Kennedy, sp. nov. Figure 7: LACM 2378, holotype, from Coon Creek, near Point Buchon, California (LACM sta. 84-22); shell length, 32 mm. Figures 8-10: SDSNH 53169, paratype, dorsal and ventral views of adult mesoplax (width, 8 mm) and right valve of same specimen (length, 34 mm); from Bolinas, Calif. Figure 11: SDSNH 53170, paratype, from Monterey Bay, Calif.; length, 41 mm. Figure 12: SBMNH 34955, paratype, from Del Monte Beach, Monterey Bay, Calif.; length, 49 mm. Figure 13: LACM 2381a, paratype, from Point Fermin, San Pedro, Calif. (LACM sta. 60-104); length, 34 mm. Figure 14: SBMNH 34956, paratype, same lot as Fig. 12; length, 49 mm. Figure 15: CAS 028804, paratype, from Del Monte Beach, Monterey Bay, Calif.; length, 44 mm.

overlaps umbonal-ventral ridge. Posterior muscle scar elongate-oval in outline. Pallial sinus broad, extends beyond umbonal-ventral ridge, sometimes to anterior margin. Apophyses flattened, not bladellike, rotated 20–25° from long axis of shell, wider ventrally, protruding at angle slightly anterior to that of umbonal ridge.

Periostracum moderately heavy, persistent, exists inside shell at siphonal opening only as narrow marginal band. Siphons creamy white in color, with small chiseled-appearing rectangular (not rounded), ridged “warty” protrusions that decrease in tuberosity and random orientation toward siphonal opening, where they are smaller, more closely spaced, and concentrically oriented. Inhalant and exhalant openings separate, ringed with papillae, exhalant opening one-third to one-quarter size of inhalant opening.

HOLOTYPE: Of *Penitella richardsoni*, LACM 2378, a live-collected specimen in alcohol, from LACM sta. 84-22, San Luis Obispo County, California. Dimensions: shell length, 32 mm; height, ca. 20 mm.

Paratypes: AMNH 104306 (2 specimens), Waterman, east of Port Orchard, Washington. CAS 028804 (figured specimen), and 065056 (1 specimen), both from 18 m (10 fms) off Del Monte Beach, Monterey Bay, Calif. LACM 2379 (1 specimen in alcohol), from LACM sta. 42-24 [AHF sta. 1466-42], Sunset Bay, Oregon; 2380a–e (5 dry specimens) from sta. 60-22, off Del Monte Beach, Monterey Bay, Calif.; 2381a, b (two specimens, 2381a figured) from sta. 60-104, Point Fermin, San Pedro, Calif.; 2382 (1 specimen) from sta. 61-111, Carpinteria, Calif.; 2383a, b (2 specimens) from sta. 66-2, Camalu-by-the-Sea, Baja California; 2384 a, b (2 specimens) from sta. 68-248, near Duxbury Reef, Bolinas Bay, Calif.; 2385 (1 specimen) from sta. 72-106, Middle Cove, Cape Arago State Park, Oregon; 2386a–e (3 dry specimens [2386a–c] and 2 specimens in alcohol [2386d, e]) from sta. 77-111, near South Point, Shell Beach, Calif. MCZ 189752 (1 specimen in alcohol), Culvers Point, San Juan Island, Washington; 195299 (4 specimens in alcohol), Whites Point, Palos Verdes Peninsula, Calif.; 278141 (3 specimens in alcohol), False Narrows, near Nanaimo, British Columbia. NMC 92791 [ex 45600] (1 specimen), Victoria, Vancouver Island, British Columbia. NSMT Mo64634, Mo64635 (2 specimens), Del Monte Beach, Monterey Bay, Calif. SBMNH 34955, 34956 (2 figured specimens), Del Monte Beach, Monterey Bay, Calif. SDSNH 53169 (figured by KENNEDY, 1974: figs. 36–38), from Bolinas, Calif.; 53170 (figured by KENNEDY, 1974: figs. 39, 40), from Monterey Bay, Calif. UCLA 20643 (4 specimens), from Tacoma, Washington. UCMP 38212 (1 specimen) from UCMP loc. B-6418, Scotts Creek, northwest of Santa Cruz, Calif. USNM 859330 [ex 334655] (2 specimens), Monterey, Calif.

Numerous lots of *Penitella richardsoni* were examined in the course of this study; unless listed above, they are specifically excluded from consideration as type material.

Type locality: LACM sta. 84-22, rocky intertidal zone, cove at mouth of Coon Creek, 0.6 km NNE of Point

Buchon, south of Morro Bay, San Luis Obispo County, California (35°15'36"N, 120°53'48"W). Collected by C. Clifton Coney (CCC 84-9), 19 May 1984. Holotype associated with one specimen of *Penitella conradi* Valenciennes, 1846.

Distribution: Nanaimo and vicinity, east coast of Vancouver Island, Strait of Georgia, British Columbia, Canada (~49°10'±3'N) (MCZ 278140, 278141), to Sacramento Reef, just south of Isla San Geronimo, Baja California, Mexico (29°43'42"N) (KENNEDY, 1974:46). I have not been able to confirm any of the published records of *Penitella* “*gabbii*” from Alaska (e.g., TURNER, 1955:88; BERNARD, 1983:61). Specimens cited by TURNER (1962) from the Queen Charlotte Islands, British Columbia, are *Penitella turnerae* Evans & Fisher, 1966.

Etymology: The species is named in memory of Richard A. Richardson (1948–1987), and is dedicated to his wife Judy and their son Justin.

Remarks: *Penitella richardsoni* is easily separated from all other eastern Pacific species of *Penitella* by its narrow umbonal reflection that is only lightly appressed over the umbo, but free centrally and anteriorly. Other differences are given in the diagnosis section, above. The holotype of *P. gabbii* (ANSP 51085; Figures 1, 2) from Japan is similar, but has a more flaring umbonal reflection, less angulate junction of the concentric sculpture across the umbonal-ventral sulcus, and periostracal attachment scars within the siphonal opening.

Although *Penitella richardsoni* is widely distributed and ranges at least from British Columbia to Baja California, it is not anywhere common, except perhaps in Monterey Bay, central California. Unconfirmed records of this species (as “*P. gabbii*”) from Alaska may refer to *P. hopkinsi*, which has a mesoplax similar to that of *P. richardsoni*. At least one fossil record of “*P. gabbii*” (Pleistocene, Fivemile Point, Oregon, LACMIP loc. 3950) is reallocated to *P. hopkinsi*. Additional confirmed locality records of *P. richardsoni* from the Pleistocene include the second and tenth terraces on San Nicolas Island, off southern California (LACMIP loc. 11751 and UCMP loc. D-9616, respectively).

Recently, GAZDZICKI *et al.* (1982) reported a species of *Penitella* from Pliocene glaciomarine sediments of the Polonez Cove Formation (Siklawia Member) on King George Island, South Shetland Islands, Antarctica, which they (p. 732) compared to “*P. gabbii*” from the eastern Pacific. The specimens do not belong to *Penitella*, but represent one of the austral species of *Pholadidea* Turton, 1819.

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